

PATENTS  
112055-0040  
17732-38560.00

### REMARKS

The present response is within the three month period after the office action dated 04/19/2004. This amendment places the application in a form for allowance.

Since the filed amendments and the Examiner's office actions seem to be inconsistent with each other, I would appreciate a telephone conference with the Examiner on the issues in this case. Please call Ed Paul at 617 951 3040.

I. This first section addresses issues in the Examiner's office action of 4/19/2004, since there seems to be some confusion. Section II discusses the claims as now amended.

I.1 On page 5 the Examiner states that the claims (without the present amendment) "are limited to a substrate mounting a single die down die and a single die up die." This is just not so, Claim 18 before and as now amended does not claim a die at all. Maybe the Examiner meant that the claim is a substrate suitable for mounting a single die down die, etc. Claim 18, prior to and after the present amendment, claims a substrate suitable for mounting a single die down die, with one set of contacts that are in a die down die orientation (to accept a die down die) and a second set of contacts in a die up die orientation (so that the connections will match a die up package lead frame). Orientation is a structural term that refers to the location or pattern of the contacts being about the same as the pattern of the contacts on the die type. That is, the second contacts in a die up orientation are contacts located on the substrate in the same relative positions as would be the contacts on a die up die (if mounted into the die up package). Again this is a structure

PATENTS  
112055-0040  
17732-38560.00

limitation – not functional. Those contacts will be next to or adjacent to the lead frame contacts so that the connecting wires do not cross each other. These aspects are well discussed in the original application, see page 3, lines 2 et seq.

I.2 Next, the Examiner notes the Kuhn (FIG. 2) shows “only one die down die and one die up die 22.” However, Kuhn does not mention or distinguish anywhere in his patent die up or die down types of dies, and die 23 (the one underneath in Kuhn’s FIG. 2) is not necessarily a die down die, it could be either die up or die down. It is not clear how the Examiner concludes die 23 is a die down die.

I.3 Next, the Examiner discusses (at the bottom of page 5) “that the specification permits ....does not imply that the substrate is unable of receiving more than one chip as suggested by the applicant.” Later, the Examiner notes that the specification as originally filed does not suggest the substrate is exclusive for one chip.

The original application shows and discusses a substrate with only one die down chip mounted. Thus the word “single” as used in the claims, although not found in the original specification, adds no new matter.

As originally used in the specification and claims as filed, the indefinite article “a” assumes the typical patent definition of “one of more.” So a single item is an inherent part of “a.” Since the Examiner cited Kuhn as a primary (35 U.S.C. 102(b)) reference against the prior claims, and Kuhn teaches and discloses only multiple chips on a substrate, the earlier amendment limited the present invention claim to a “single” chip thinking that it distinguishes Kuhn. This earlier amendment took a claim that accepted a

PATENTS  
112055-0040  
17732-38560.00

range of "one or more" chips and restricted the claim to accept a single chip to help distinguish Kuhn. This is standard prosecution process, a broader claims is narrowed to distinguish prior art. There is nothing in patent law that says that the original specification had to limit the invention to a single chip. The law requires that the claim be new, unobvious and that it is enabled and definite (the 102, 103 and 112 parts of 35 U.S.C.). The use of a single chip is shown, discussed, enabled in the application as filed, and therefore meets all patent law requirements.

The remainder of page 6 of the office action discusses Kuhn and just does not apply. Kuhn is not capable of performing the intended use of the present invention, and removing one chip from Kuhn does not help. Taking a die-down chip (as defined in the present application – See FIGS. 1 and 2) and placing that chip in Kuhn's location 22 or 23 will not effect the contact reversal of claim 18 as amended, unless additional, unobvious elements are added. Kuhn must (but does not) disclose etched traces that run to contacts orientated as are the contact pads on a die-down die so that a die down die could be mounted. The traces then must run to contact pads oriented in the die-up pattern. This limitation is in earlier claim 18 (without the present amendment), but the Examiner states, on page 6, that this is a functional limitation. The "orientation" of contacts is a structural limitation. And, Kuhn does not suggest, much less state, these limitations, and there is no motivation cited anywhere, except from the present application that would motivate or entice Kuhn to include these limitations. Only by recognizing the cost benefit, of having only one IC package that will accept a die-up die or a die-down mounted to the inventive substrate, would motivate Kuhn to change his invention. Only the present applicant rec-

PATENTS  
112055-0040  
17732-38560.00

ognized this benefit. However, looking at the present invention to provide the motive is not permissible.

The applicant is generating a 132 Declaration, that will be filed under separate cover that evidences the commercial benefit of the present invention. Although commercial success evidences unobviousness, it is felt that the Examiner is dealing with an unobviousness rejection, not an anticipation, so the 132 contributes weight to the allowability of the present invention.

## II. The present amendment:

Paraphrasing, the claim (as amended) covers a substrate that accepts a die down die and reverses the contact pattern to provide a contact pattern that allows the combination to be mounted in an IC chip package designed to accept a die-up die. In claim 18 as amended, neither the die-down nor the die up dies themselves are claim elements – the claim elements are the contact orientation or pattern that matches a die down die and the contact pattern that matches the contact pattern of a die-up die. These patterns place chip contact pads adjacent to contacts and lead frame contacts so that wire connections do not cross each other. See page 3, lines 4-18, of the original application.

Claims 18, 19, 21, 23, 34-37, and 45 stand rejected under 35 USC 102(b) citing Kuhn, U.S. patent no. 5,793,101 as anticipating these claims. Claims 22 and 35 stand rejected under 35 USC 103(a) citing Kuhn in view of Harper as suggesting these claims.

PATENTS  
112055-0040  
17732-38560.00

As the claims now stand if independent claim 18 is allowed all remaining claims will also be allowable. With that in mind, the present amendment adds the following to emphasize the structural limitations of amended claim 18:

the plurality of electrically conductive traces running under from one side to the opposite side of a single die down die, if one was mounted, and

wherein the electrical traces define second contacts located on the opposite side relative to the first contacts, the second contacts arranged in a die up orientation,

This amendment more clearly eliminates the dies from being claim elements and provides language more easily understood as structural. The substrate itself is the subject of the amended independent claim 18. An alternative view is that a substrate made by someone else without any mounted dies could infringe claim 18 as amended.

No new matter is added hereby since the "side to side" reversal is clearly shown in the drawings, and is discussed in the original application as filed. The word "side" is clearly defined in these drawings and supported in the original application on page 3, lines 4-17. Further original claim 1 as filed specified the traces running under a mounted die — that is to run from one side to the other, as shown in the drawings, again to effect the orientation reversal.

These added limitations are now included to emphasize structural differences over the Kuhn reference. The structural differences include traces that "reverse" the contact pattern by traveling from one side of a die (if mounted) to the opposite side and then to

PATENTS  
112055-0040  
17732-38560.00

contacts arranged in a die-up orientation. These structural elements are not disclosed in Kuhn and are not obvious from Kuhn as explained below.

First, Kuhn does not mention a die down-die much less in contrast to a die up-die.

It is of no importance to Kuhn as his invention is directed to increasing IC density.

Kuhn's FIG. 2, as discussed by the Examiner, probably, but not necessarily, illustrates a die-up die (22) since the connections are made as shown in FIG. 1 of the present invention, but Kuhn does not so designate the die as die-up. Kuhn also shows a chip in his FIG. 2 labeled 23, the Examiner has labeled this chip as a die-down die, but Kuhn does not do so, and from the drawing it cannot be determined. It is not understood why the Examiner designates this chip in this fashion since Kuhn does not. Again, Kuhn has no reason to consider the die-up/down types of chips since he is interested in getting more chips in a package not modifying effective chip pin outs.

Second Kuhn does not disclose, discuss or suggest running traces traversing a die, and he does not disclose, discuss or suggest reversing the contact orientation of the chip so that a die-down die mounted to the substrate will provide a die-up contact layout.

Kuhn does not suggest or realize the cost disadvantage that the present invention is addressing. That cost is having and maintaining two different types of IC packages, one for a die-up die and a different one for a die-down die. The present invention provides a substrate so that a single package can be used for mounting either a die up die or a die down die. The die up die would be mounted in a die up IC package as usual, and the die down die would be first mounted to the inventive substrate and the combination

PATENTS  
112055-0040  
17732-38560.00

mounted in the die up IC package. This is possible because the inventive substrate provides a side to side reversal so that the package lead frame connections are adjacent to the substrate contact points that are arranged in a die-up pattern. The reduction in cost of maintaining one rather than two IC package types is significant and is the motive for the present invention. Kuhn does not discuss or suggest any such issues.

That being said, the Examiner has rejected claim 18 under 35 USC 102(b) citing Kuhn. Section 102(b) means that Kuhn has each and every limitation in claim 18. As shown above, Kuhn does not have (or suggest) the limitations of claim 18 as now amended.

Respectfully, the Examiner on page 3, at the end of paragraph 6, referring to Kuhn, states that "The substrate can be placed into a package designed to accept a single die up dies (i.e. printed circuit board). The electrical connection may be made to the substrate second contacts as if it were a single die up die (col. 1/lls. 14-27)."

Col. 1, lines 14-27, only discusses standard wire bonding of a die to a lead frame fingers. There is no suggestion of making wire bonding that would perform the inventive reversal as suggested by the Examiner.

Later in the Office Action on page 5, paragraph 18, the Examiner states that "Kuhn shows a substrate for mounting a single die down die and a single die up die." There is no such specificity in Kuhn with respect to die up or down and none of Kuhn's figures, e.g. Kuhn's FIG. 2, show or indicate a specific die type.

PATENTS  
112055-0040  
17732-38560.00

Later on Page 6, the Examiner states that "intended use and other types of functional language must result in a structural difference....in order to patentably distinguish the claimed invention...." Later in paragraph 19 the Examiner states that "Kuhn teaches the claimed subject matter because the substrate 27 is capable of accepting both types of die orientations as evidenced by figure 2. Note that the claim 1 claims a substrate in terms of an intended use. If the prior art structure is capable of performing the intended use, then it meets the claim (see comments above)." It is presumed that the Examiner is referring to Kuhn's claim 1.

Kuhn's claim 1 and Kuhn's specification are not capable of performing the intended use of the present invention. Moreover, the present invention as claimed details structural differences, and it would take recognition of the problem to be solved or the advantages of the present invention for Kuhn to incorporate the structural specific layout of traces to address that problem. Kuhn is silent on these specific issues. Only by looking at the present invention and directing specific additions to Kuhn could possibly leads to the present invention.

That brings us to what appears to be the basis for the Examiner's position, namely that Kuhn, although not referenced directly, COULD be used to accomplish the die-up/down electrical contact reversal of the present invention. Kuhn's chip 23 COULD be a die-down die, chip 22 COULD be a die-up die, the traces on Kuhn's substrate COULD lie under the chip and the traces COULD effect some pinout reversal. These "COULD's" relate to items that are silent in Kuhn, and there is no indication of how to answer or sup-



PATENTS  
112055-0040  
17732-38560.00

ply the detail that would lead to the present invention. As stated above, Kuhn does not designate types of chips; Kuhn does not show traces on the substrate; Kuhn does not reverse effective die pinouts. The only way to answer these "COULD's" to anticipate the present invention is by looking at the present invention and asking the specific questions, and such is impermissible. Placing a die down die in Kuhn's item 22 or 23 of his FIG. 2 will not achieve the re-orientation of the contacts of claim 18, without adding significant additional specificity and limitations not found in Kuhn. The lead frame wires in Kuhn's chip 22 connect to the chip itself NOT to pads on the substrate. Claim 18 as amended has the limitation that the substrate has pads oriented in a die up orientation. The clear implication is that the wires from the die up lead frame would connect to these pads on the substrate – they cannot connect to the pads on the die down die! Chip 22 cannot be a die down die unless the lead frame contacts were somehow reversed. The contacts to ship 23 are not shown or indicated as connecting to the lead frame contacts (item 21). There is no place in Kuhn where a die down die can placed to achieve the pin re-orientation or reversal of claim 18 without adding significant specificity that is simply not found or suggested in Kuhn.

The Examiner mentions that Kuhn is "capable" of performing the intended use. But, being "capable" of performing the claimed invention does not mean "capable" by asking leading questions that suggest structural changes taken from the present invention, and with no motivation to ask these leading questions found in the cited prior art.

PATENTS  
112055-0040  
17732-38560.00

In passing, "inherency" cannot be the basis of such a rejection since a 102(b) rejection on inherency requires that the above differences in claim 18 are necessarily part of Kuhn's disclosure. That cannot be so since Kuhn may be packaging a number of die up chips in that package without any contact reversal. Inherency cannot be used to conclude that Kuhn is disclosing a die-down die on a substrate that allows the combination to be packaged in a die-up package. There is no necessity as anticipatory inherency requires.

Lastly, there is a significant commercial advantage to the present invention, as evidenced by the 132 Declaration. The product covered by the present invention is significantly reducing the manufacturing cost of the product, and the competition has not yet (as far as is known) detected the inventive product. In the past two different packages were required, one for die-up and one for die-down chips. With the inventive substrate a single package can be used to mount either chip type. There is one less package type, less documentation, fewer manufacturing processes, one less product at distributors, one less final product inventory, testing, etc. These advantages flow from the inventive substrate and, as stated above, there is no realization of the problems and the advantages in the cited prior art that would suggest Kuhn should be modified to accomplish what the present invention does. It would be unfair to not realize the inventiveness of the present application and allow the competition to benefit from the talents of the present owner.

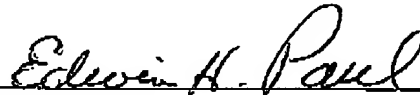
The claims have been amended to distinguish the Kuhn (US 5,793,101) reference structurally in a way that is unobvious.

PATENTS  
112055-0040  
17732-38560.00

It is respectfully requested that the Kuhn reference be removed as a reference  
against the present claims as now amended, and that a notice of allowability be issued.

Please charge any additional fee occasioned by this paper to our Deposit Account  
No. 03-1237.

Respectfully submitted,

  
Edwin H. Paul  
Reg. No. 31,405  
CESARI AND MCKENNA, LLP  
88 Black Falcon Avenue  
Boston, MA 02210-2414  
(617) 951-2500